HP Industry Standard Servers

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Deploying the Console Management Controller

Table of Contents

Abstract

The Console Management Controller is a management tool for administrators that need to monitor one or two racks in a remote environment. Sensors in the Console Management Controller allow an administrator to monitor for environmental and security concerns such as temperature, humidity, voltage, smoke, intrusion, and vibration. It also enables an administrator to remotely lock and unlock rack doors to control access to the racks. The Console Management Controller allows an administrator to set appropriate, automatic responses to changes in the status of the racks as monitored by those sensors. This paper describes suggestions for how to use the sensors within the Console Management Controller and how to configure the software to achieve the desired outcome.

Introduction

In remote locations such as branch bank offices or car rental offices, often only one or two racks of servers are required; these racks are typically deployed not in a controlled datacenter environment but in a room with standard heating and cooling, or perhaps even in a small closet. Customers need to monitor and protect these servers against disasters such as flooding, high temperature or humidity, fire, intruders, or unauthorized personnel. The HP Console Management Controller (CMC) solution provides remote monitoring and management of rack environments. With the proper setup, the CMC system can:

- monitor temperature within the rack
- monitor humidity levels in the rack
- monitor voltage within the rack
- detect smoke within the rack
- detect whether rack doors are open or closed
- detect (from vibration) someone tampering with the rack
- remotely lock and unlock the rack doors

When configured with adequate alarm thresholds, CMC can protect equipment by sending alerts or taking action based on those alerts. For example, the CMC can be programmed to turn on the rack fans when the rack temperature exceeds the maximum threshold, or to turn off the rack fans if smoke is detected. Should an unauthorized person attempt to enter the rack, the system may sound an audible alarm, send an alert message to a management console such as Insight Manager 7, send an e-mail, send a page, or activate an alarm relay switch connected to a user-programmable alarm device.

It is assumed that readers have some familiarity with CMC. The practices and recommendations made here may not apply to all customer environments. For more information, refer to the CMC webpage at http://h18004.www1.hp.com/products/servers/proliantstorage/rack-options/cmc/index.html.

Planning for Deployment

The CMC ships with the following sensors in its base kit: one temperature sensor, two intrusion alert sensors, and a voltage monitor. For customers interested in baseline environmental monitoring (such as over-temperature conditions) in a single rack, this configuration is adequate. If customers need more control, they can purchase the optional sensor kit. It contains one temperature, one vibration, one humidity, and two intrusion alert sensors. Using the optional kit enables the administrator to do more complete environmental monitoring (such as monitoring humidity levels), more complete

security monitoring (additional intrusion sensors), or monitoring more than one rack.

To protect their computing equipment against fire damage, customers should purchase the optional smoke sensor kit. Finally, customers with a critical need to protect the security of their cabinets may want to purchase the optional electronic door locking kit. Table 1 outlines the options available depending on the customer concerns.

Table 1. Sensors available for monitoring different environmental or security concerns

monitoring for:	base kit	optional sensor kit	smoke kit	electronic door lock kit
environmental conditions				
temperature	1 T sensor	1 T sensor		
humidity		1 H sensor		
voltage	1 voltage monitor			
smoke			1 smoke sensor	
security				
rack intrusion	2 door sensors	2 door sensors		
shock/vibration		1 vibration sensor		
rack access control				1 lock kit

CMC Configuration

The administrator can configure CMC information such as IP address, rack name, and physical location through Rack and Power Manager software, or by connecting a laptop computer through the serial port on the front panel of the CMC. The administrator must use Rack and Power Manager software[1] to configure the environmental and security sensor parameters.

It is important to establish the sensor parameters that will provide meaningful data over time. If parameter thresholds are too low or too close together, alerts will reflect minor fluctuations that will not harm the equipment in the rack. On the other hand, if parameter thresholds are too high or too far apart, damage may occur to equipment without any alerts occurring. Establishing meaningful parameter thresholds may require some monitoring and adjustment over time to the specific local conditions and customer requirements.

[1] Some older versions of the CMC use the Intelligent Rack Manager Lite software to configure the IP address, physical location, name, and parameter thresholds for the sensors. This document gives examples using the Rack and Power Manager software, but the processes are the same for the Intelligent Rack Manager Lite software.

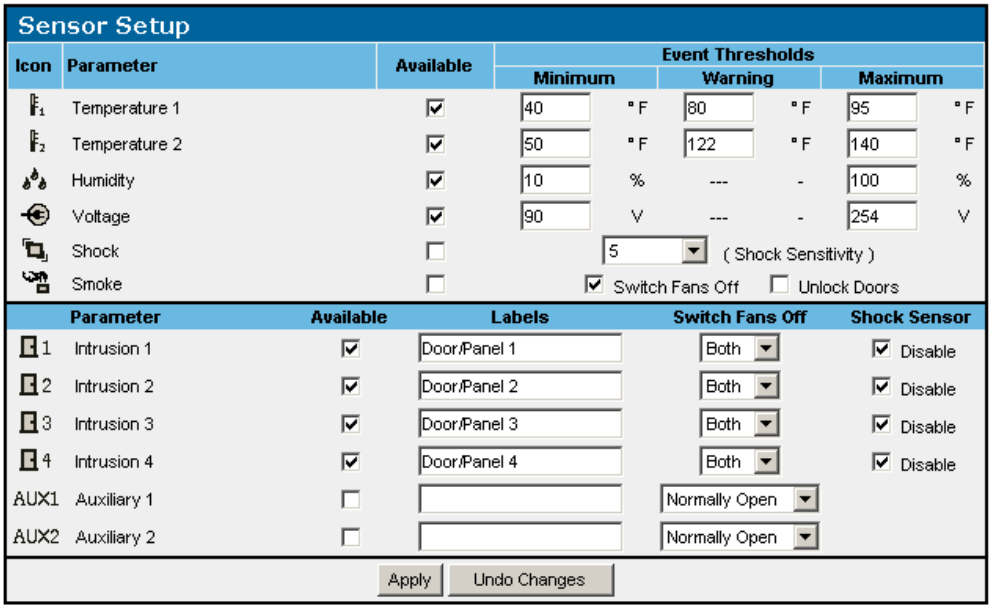
Environmental Sensors

In corporate datacenter environments, heating and cooling systems are typically designed and controlled specifically for computing. However, remote sites are rarely designed to meet the specific environmental needs of a rack of servers. Therefore, CMC provides important information that allows a remote or local administrator to monitor environmental changes such as temperature, humidity, and smoke.

Temperature

CMC can monitor up to two temperature sensors. The CMC will send an alert to the user depending on the minimum, maximum, and warning temperature thresholds. The system administrator should refer to the user manuals of equipment in the rack for suggested temperature threshold ranges. For example, the rated operating temperature range for the ProLiant DL360 G3 server is between 10° and 35°C (50° - 95°F), so an administrator using this equipment should set the warning and maximum temperatures somewhere between these limits. The administrator should configure CMC to send alerts or initiate other action (such as turning on rack roof fans) after the temperature sensor reaches the maximum or warning temperature (Figure 1).

Figure 1. Administrators can configure the sensor alerts through the Sensor Setup screen.



For monitoring a single rack, one temperature sensor can be placed in the front of the rack to measure input air temperature, and another sensor can be placed in the rear of the rack. The temperature sensor installed in the back should be placed near the server exhaust or near the most temperature-sensitive component. Then the administrator can set up the software to monitor the differences between the input and output temperatures. Monitoring the temperature differences allows the administrator to determine if excessive heat is being generated within the servers or the input air temperature is becoming too warm for proper equipment operation.

If an administrator is monitoring two cabinets with essentially the same number and type of servers (and presumably the same approximate environmental conditions), it may still be advantageous to keep both temperature sensors on a single cabinet so that both the input and exhaust air temperatures can be measured.

On the other hand, if the two racks being monitored have vastly different numbers of servers installed, it may be advantageous to place one sensor on the back of each rack to measure the exhaust air temperatures. This may also be helpful if different actions need to be taken depending on temperature. For example, the configuration of one rack may require turning on the rack fans when the maximum temperature reaches 25°C (77°F), while the configuration of another rack may require sending an alert and turning on the fans when the maximum temperature reaches 35°C (95°F).

Humidity

If the optional sensor kit is purchased, a humidity sensor can monitor humidity levels within the rack. The administrator should refer to the user guides of the installed equipment to determine appropriate minimum and maximum humidity thresholds. For example, the ProLiant DL360 G3 server has a maximum operating humidity of 90 percent relative humidity. Administrators would want to set the maximum humidity threshold within the rack to remain significantly below that to ensure that condensation and electrical shorts do not occur.

In most cases, the humidity sensor should be positioned somewhere in the front of the rack. If the customer wants to measure the humidity of the entire room, however, the humidity sensor can be placed outside the rack.

The administrator should check humidity in conjunction with the temperature sensors. For example, a simultaneous rise in temperature and humidity may indicate an air conditioning failure and that action needs to be taken such as sending alerts to the administrator or building facility supervisor.

Input Voltage and Fan Control

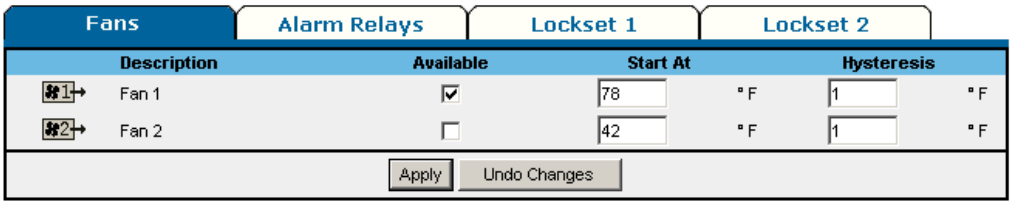
The input AC voltage can be used to monitor any 100 to 240 VAC voltage in the rack and can supply the power for up to two rack fan kits. The input AC voltage monitor is separate from the CMC power input.

Using the input AC voltage plug, the administrator can monitor the voltage to the entire rack and take action if the voltage falls below a specified threshold. The customer should not attach the AC input voltage monitor connection to a UPS. Because a UPS ensures a continuous supply of electricity by means of its battery backup, the administrator will not be able to recognize when the AC power is out.

When using the input AC voltage monitor to power up to two rack fans, the monitored voltage connection provides the rack fan voltage. If running a low-voltage fan assembly, the administrator must ensure that a low-voltage source is connected to the voltage input monitor to avoid burning out the fans.

The fans are configured in the **Fans** tab of the **Accessory Setup** screen (Figure 2). The administrator should select the **Available** checkbox only for fans that are connected to the CMC. The CMC will detect whether a fan is present by applying power momentarily during a CMC reboot. If a load is present, the fan will be shown as **Available**. If the **Available** checkbox is selected for a fan that is not connected, CMC will erroneously detect an alarm condition and send alerts.

Figure 2. Example of Accessory Setup menu



In general, the rack fans should be set to turn on when the temperature increases above the maximum threshold. It is important to realize that this fan threshold can be different from the maximum or warning thresholds for the temperature sensors. If the rack fan is able to cool sufficiently so that the temperature decreases the number of degrees set by the hysteresis level (in figure 2, for example, if the temperature cools 5° to 90°F), then the fan turns off.

The ability to set thresholds that will cause the fans to turn on or off automatically provides several benefits:

- The fans provide additional spot cooling if there are "hot spots" in the servers due to localized airflow restrictions.
- The fans allow more time for taking action if there is an over-temperature problem due to an emergency such as a failed air-conditioning system. If the software is configured to alert the administrator when the fans turn on, the administrator has advance notice of a temperature problem and the time to shut down the servers gracefully.
- The automatic fan thresholds eliminate the need for the rack fans to run continuously, thereby reducing energy costs and noise levels, yet ensuring adequate cooling air for the servers.

Smoke

The optical smoke sensor detects smoke (particulate matter) passing by the sampling tube and uses an intake fan to draw the smoke from the sampling tube into the smoke sensor. The sampling tube should be placed in the path of the exhaust air from the servers. If smoke is detected, the smoke sensor intake fan will automatically shut off. After the smoke has cleared, the sensor can be reset by pressing the RESET button on the side of the smoke sensor housing for three seconds. If its intake fan stops running or runs too slowly, the sensor will not detect smoke. This type of fan fault will also trigger a smoke alarm. A smoke alarm should be investigated to determine whether smoke is present or a fan fault has occurred.

To reduce damage from smoke and fire, HP recommends that administrators configure the software to shut off any rack fans if smoke is detected. HP also recommends that administrators configure the software to unlock the rack doors if smoke is detected so that an authorized person can access the rack equipment.

The smoke sensor is for use only with the CMC and is not suitable for connection to building fire alarm systems.

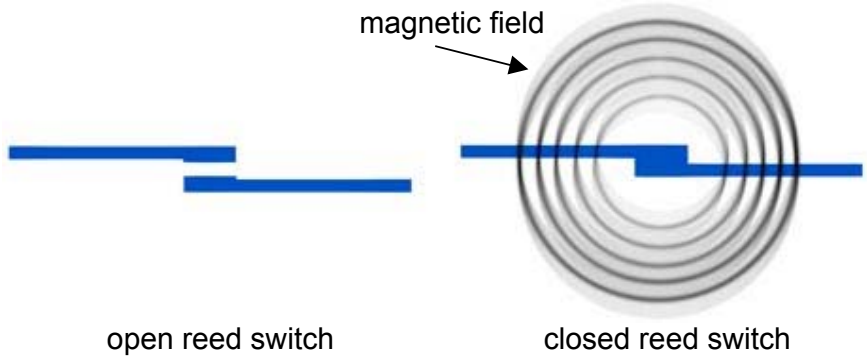
Security Sensors

With the increasing importance of information in today's society, it is critical that computing equipment be secure. For example, a server with hot-plug drives placed in an unlocked server cabinet could be an easy target for someone with mischievous or malicious intent. The security technology within CMC provides an extra layer of physical security through the intrusion sensors, shock and vibration sensors, and the electronic door locks.

Intrusion Sensors

An intrusion sensor consists of two parts: a magnet and an electrical reed switch (Figure 3). The reed switch consists of two ferromagnetic contacts. When the magnet portion of the sensor is in close proximity to the reed switch portion (right side of Figure 3), the magnetic field causes the two contacts in the switch to close (the rack door is closed). When the magnetic field is removed (as when someone opens the door of the rack), the intrusion sensor detects the reed switch opening and the CMC sends an alert identifying the open door.

Figure 3. Schematic illustrating that the reed switch closes when a magnetic field is nearby



The magnet should be installed on the inside of the rack door and the electrical switch on the rack. The administrator should make sure that the magnet and switch align with each other (so that they cause the switch to close when the door closes) and that there is sufficient clearance for the doors to close.

With the optional sensor kit, there are four sets of intrusion (door) sensors. If the administrator wants to monitor more than two racks or wants to monitor two racks plus the external door(s) to the room, there are two options: intrusion sensors can be wired in series, or the auxiliary input ports can be used for two additional intrusion sensors.

Wiring intrusion sensors in series allows multiple sensors to use a single port. For example, if there were three racks in the room, it is impossible to monitor all three discretely using a single CMC. However, the administrator could place one sensor on rack 1 and connect it to port 1. The administrator could wire two sets of intrusion sensors in series and place one of these on rack 2 and the other on rack 3. Both sensors would be connected to port 2. Then, for example, if an alarm goes off for the second intrusion sensor (port 2), the administrator would know that there is a problem in either rack 2 or rack 3.

Using the auxiliary input ports, as described in the auxiliary input port section, the administrator can monitor up to six intrusion sensors independently.

Shock and Vibration

The mechanical shock and vibration sensor can alert system administrators when a rack has been bumped or struck. This sensor will allow users to detect if an intruder is trying to forcibly remove side panels or trying to knock the rack down. Of course, the shock and vibration sensor could also be tripped by an earthquake or other natural disaster.

The sensitivity of the shock sensor can range from a setting of 1 (low sensitivity) to 10 (high sensitivity). HP recommends a vibration setting of 5 initially, until a need is established for higher or lower sensitivity.

The vibration sensor can be attached to one of the side panels, to the inside face of the rack door, or to the rack frame. Lightly-weighted racks will vibrate more than heavily-weighted racks, and may saturate the vibration sensor even at a setting of 1. To avoid nuisance alerts, the administrator may need to relocate the sensor to a lower position on the rack frame and adjust the software sensitivity setting.

To gather additional security information, it may be helpful to use the vibration sensor in conjunction with the intrusion sensors. For example, if CMC sends an alert that the vibration sensor has tripped, but no door alert has been sent, then an earthquake might be occurring. If, on the other hand, CMC sends alerts for both the vibration and the intrusion sensors, then an intruder is trying to access the equipment in the rack and the administrator should take appropriate action. For example, to thwart such an attempted break-in, the administrator might configure the software to turn on the auxiliary outputs (if wired to a user-provided alarm or siren), to shut down the servers through a command line action using Rack and Power Manager, or to alert the local facilities supervisor.

Electronic Door Locks

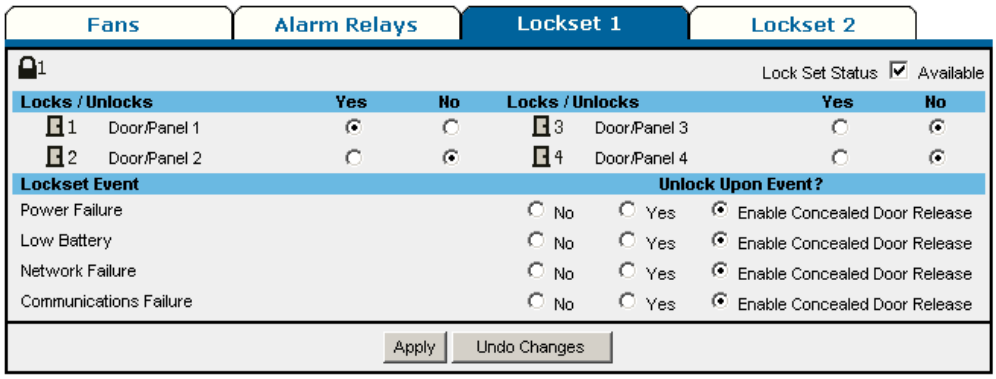
The optional electronic door locking kit allows an administrator to lock and unlock the rack doors remotely. This permits authorized on-site personnel to access the racks for specific purposes, without giving them unlimited access to the racks. Electronic door locks will eliminate the possibility that an intruder who has stolen keys to the racks can actually access the rack with those keys.

The kit contains hardware to be mounted on the rack doors and a motor that activates or deactivates the lock according to the software commands. The motor is equipped with its own battery-backed power supply, which can provide power for up to six hours.

The electronic door locking kit should be installed on the front and rear doors of the rack according to the instructions included with the kit.

To enable someone to access the rack when no administrator is available to unlock the doors remotely, an emergency concealed door release can be installed in an out-of-the way location. For example, the cable release could be placed at the upper back of the rack where it can be reached by inserting a stylus through the perforated rack doors. This concealed door release must be enabled in the **Lockset** tab of the **Accessory Setup** screen (Figure 4).

Figure 4. On the Lockset tab of the Accessory Setup screen, the administrator can program the electronic door lock functionality for emergency situations.



The administrator can also establish the response of the electronic door lock to certain conditions. The administrator can configure the doors to unlock or stay locked if there is a:

- power failure
- low battery condition on the door lock
- network failure
- direct communication failure between the lock kit and the CMC

As an example of how to set these parameters, suppose the administrator wants to prevent an intruder from circumventing the CMC by disconnecting the network connection or power to the CMC. In the **Lockset** tab of the **Accessory Setup** screen (Figure 4), the administrator can select **No** in the **Unlock Upon Event?** column to keep the rack doors locked in the case of power failure or network failure.

On the other hand, if the administrator believes that the network or power may be interrupted for some legitimate reason, he can program CMC to unlock the rack door so that the administrator or technician can access the rack equipment for service.

Auxiliary Input Ports

To provide a customer with even greater flexibility in deploying the CMC, it has two auxiliary input ports that can be used to connect additional intrusion sensors or a user-defined sensor.

Connecting both auxiliary input ports to intrusion sensors allows up to six sets of doors to be monitored. An administrator may want to place these optional sensors in the doors to the room, so that an alert is sent when anyone enters the room.

If an administrator connects a user-defined sensor to the auxiliary input port, the sensor must be binary, such as an on/off switch. The input cannot be a sensor that sends an analog signal such as temperature or humidity levels. For example, if the remote site has a comprehensive building management system, the administrator may want to use this auxiliary input to interface to the building management system. If a pre-defined condition is reached in the building management system, it would trip the input sensor and the administrator would receive an alert through the CMC.

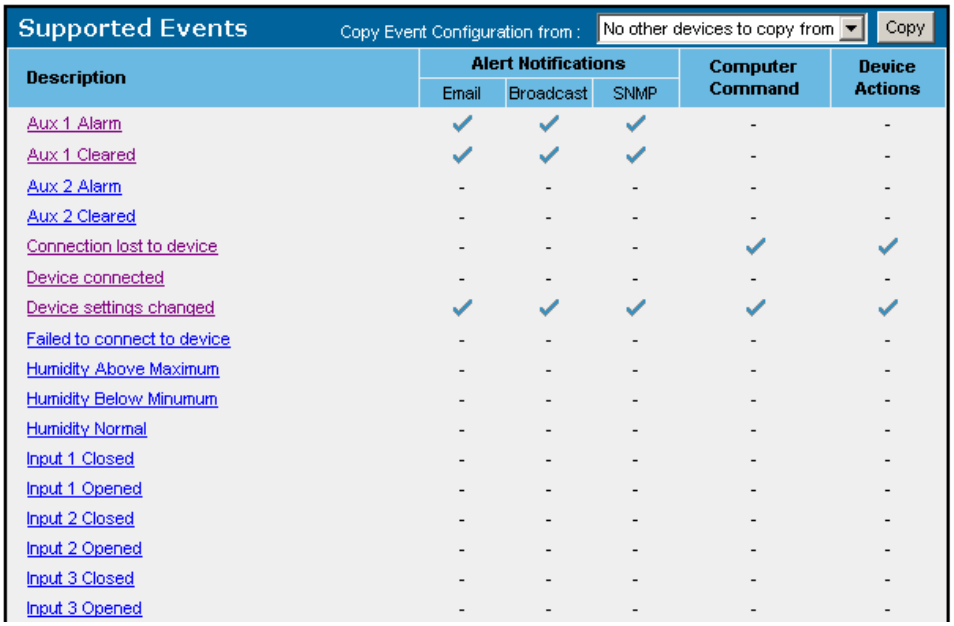
Alerting Capabilities

Based on the threshold parameters established for each sensor, CMC can send an alert, such as those shown on the **Event Response Overview** screen (Figure 5). Depending on how the administrator configures the Rack and Power Manager software, an alert can trigger any or all of these actions:

- activate relay switch #1
- activate relay switch #2
- audible alarm
- email alert
- pager alert (via email[2])
- SNMP trap
- broadcast message

For example, if someone tries to open a rack door that is monitored by an intrusion sensor, the CMC can activate an audible alarm and page the system administrator.

Figure 5. The Event Response Overview screen summarizes how alerts are issued for each alarm condition on the CMC.



Description	Alert Notifications			Computer Command	Device Actions
	Email	Broadcast	SNMP		
Aux 1 Alarm	✓	✓	✓	-	-
Aux 1 Cleared	✓	✓	✓	-	-
Aux 2 Alarm	-	-	-	-	-
Aux 2 Cleared	-	-	-	-	-
Connection lost to device	-	-	-	✓	✓
Device connected	-	-	-	-	-
Device settings changed	✓	✓	✓	✓	✓
Failed to connect to device	-	-	-	-	-
Humidity Above Maximum	-	-	-	-	-
Humidity Below Minumum	-	-	-	-	-
Humidity Normal	-	-	-	-	-
Input 1 Closed	-	-	-	-	-
Input 1 Opened	-	-	-	-	-
Input 2 Closed	-	-	-	-	-
Input 2 Opened	-	-	-	-	-
Input 3 Closed	-	-	-	-	-
Input 3 Opened	-	-	-	-	-

Alarm Switch Relays

CMC has two user-programmable alarm switch relays that can be used at a customer's discretion to connect strobe lights, audible alarms, or similar devices indicating an alarm situation. The alarm switch relay provides a means to alert local personnel of conditions in the computing room.

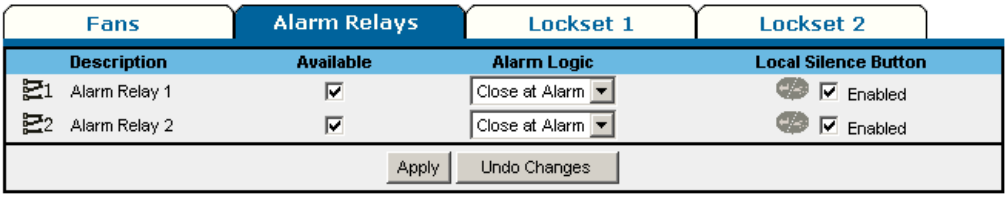
The administrator can interface the alarm switch relay with devices such as external door locks for the computing room, strobe lights or warning bells, emergency dialers, or with inputs to a building management system.

The alarm switch relay can be either closed or opened when the alarm is triggered (see Figure 6). For example, if alarm relay 1 is a light switch or siren, the administrator might want to have the relay close (turn on) when some fault condition occurs so that the light or siren turns on. On the other hand, if the administrator installs a status light that indicates normal conditions, he or she can configure the alarm switch relay to open (turn

[2] HP Rack and Power Manager sends only email messages and not analog messages to pagers.

off) under a fault condition so that this normal status light turns off when an abnormal condition occurs.

Figure 6. Example of how the alarm switch relay can be configured through the Alarm Relays tab of the Accessory Setup screen

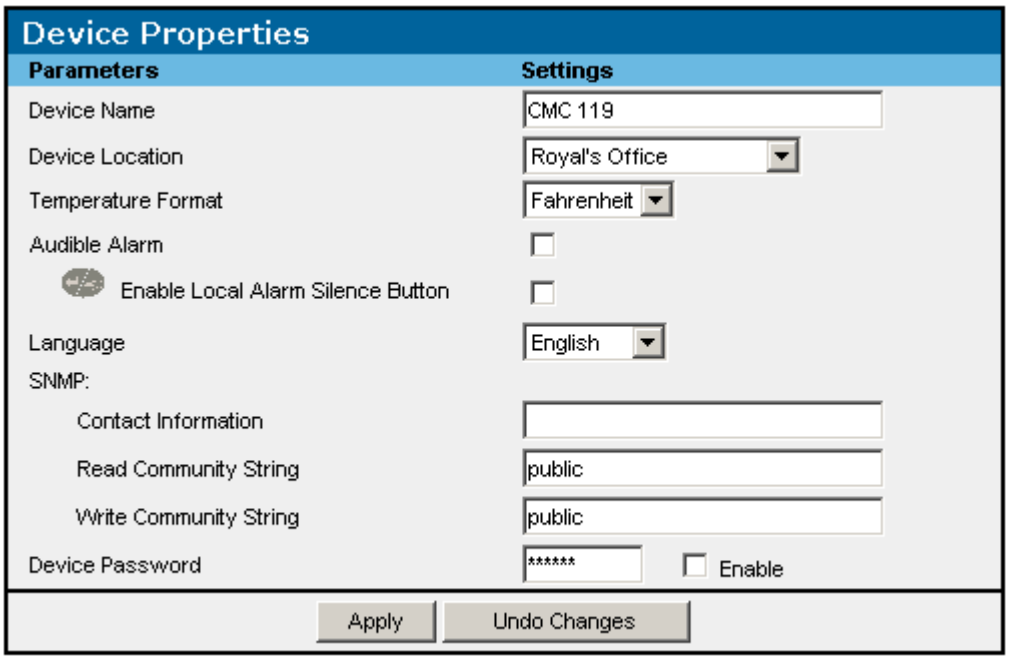


If the alarm switch relay is connected to a user-supplied audible alarm such as a siren, the administrator can configure the alarm so that local personnel can turn it off using the silence button on the front panel of the CMC. This allows the local onsite personnel to acknowledge the alarm condition while the cause is corrected, and allows subsequent alarm conditions to register at the CMC and set off a new audible alarm.

Audible Alarm

An audible alarm located on the CMC can be turned on or off globally using the **Device Properties** window shown in Figure 7. (This is not the same as the alarm relay switch described in the preceding section.) Thus, if the **Audible Alarm** box is checked, the CMC audible alarm will go off for any event in which the administrator has set the response for an audible alarm to occur. Like the alarm relay switch, the audible CMC alarm can be set so that local personnel can turn it off using the silence button on the front panel of the CMC.

Figure 7. Example of how to enable the internal CMC alarm in the Device Properties window



SNMP Traps

To receive alerts through standard management software such as Insight Manager 7 and OpenView, the administrator must configure the CMC device and the management software to send and receive the proper SNMP trap destination addresses. The paper titled "Integrating the Compaq Console Management Controller with Compaq Insight Manager XE and Compaq Insight Manager 7," document number 15UM-1101A-WWEN, gives complete details on this process.[3]

To integrate with OpenView, consult the recommendations in the OpenView documentation.

Conclusion

The Console Management Controller is one of several tools that HP provides to help administrators monitor their computing equipment. The CMC provides a specific solution to the administrator that needs to monitor a small rack environment (one or two racks) — especially in remote locations such as branch offices. When the sensors are properly placed and the software thresholds are properly configured, CMC provides the benefits of protecting equipment against environmental and security hazards. It also can improve the cost-effectiveness of a remote site by limiting the number of personnel required to locally monitor equipment. For the CMC to be most effective, the administrator must carefully consider what scenarios are possible, what values should be set for threshold alerts, and the appropriate responses to those alerts. The administrator should also watch the alert logs carefully and adjust the alert thresholds as necessary for the unique customer environment.

For More Information

Refer to the CMC webpage at http://h18004.www1.hp.com/products/servers/proliantstorage/rack-options/cmc/index.html for more information.

Feedback

Please direct comments regarding this communication to the ISS Technology Communications Group at this Internet address: TechCom@HP.com

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[3] The Insight Manager 7 integration paper is available at ftp://ftp.compaq.com/pub/products/servers/proliantstorage/rack-options/15UM-1101A-WWEN.pdf